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# THE SOLUTION OF THE SCHOOL ROOM SEATING PROBLEM

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A school desk to meet the demands made upon it may, for convenience, be considered under four general heads:

**FIRST:** It must be properly constructed.

**SECOND:** It must be adapted to its special use.

**THIRD:** It must be sanitary.

**FOURTH:** It must be hygienic.

In the opinion of all those who are interested in the use of school desks each of the above points are very important and they are arranged above in what is generally agreed upon as the order of their importance, which increases from the first to the fourth.

While the construction of a seat is of very great importance, a perfect construction from a mechanical standpoint would not justify the use of a seat that was not properly adapted to the particular use for which it is intended.

Again, the mechanical construction may be perfect and the desk may serve the pupil very well and still be insanitary, and, lastly, it must be hygienic, that is, so constructed as to conform to the demands made by the Laws of Hygiene and the growth of children so that no injury will come from its use in the school.

It will, therefore, be easy to see that in the manufacture of a school desk no one of the above general advantages should be accomplished at the expense of another. It is necessary to construct the desk as near mechanical perfection (when service and wear are properly considered) as it is possible to make it, and at the same time nothing must be introduced for the purpose of securing correct construction or cheapen the construction which would render it inconvenient in its use or prove to be insanitary or unhygienic.

As a matter of fact, all of the above points are so closely connected with each other that it is impossible to separate them.

However, it is convenient for our present purpose to consider them separately in order to place a proper relative value upon each of them, and, furthermore, in order to furnish an intelligent basis for the criticism of school seating.

### *First: Construction*

The Pedestal Desk as constructed is a combination desk, i.e., the desk and chair are jointly supported by a single pedestal. The pedestal is of such large dimensions that it practically acts as a direct support for the desk and the chair separately, so that when it is properly fastened to the floor the pupil using the desk does not interfere in any way with the one occupying the seat, and the pupil occupying the seat does not in any way interfere with the pupil using the desk. This is a very important point which must be secured in the combination desk, and which is secured in the Single Pedestal Desk.

The materials used in the construction of this desk have been especially selected as best adapted therefor. For example, the pedestal is constructed of steel of just the proper strength to allow enough elasticity to absorb or take up any jolting or jarring which may occur in the use of the desk and which in any other material would transmit rather than absorb vibration, and eventually loosen the desk from the floor.

After proper installation has been made, this desk has held tightly to the floor for five years in continuous service without a single screw loosening, the desk standing as firmly upon the floor as it did on the day it was placed there.

Those to whom the Single Pedestal Desk has been shown for the first time have commented upon the large size of the pedestal. The size must be just what it is in order to make a permanent installation, and to secure a combination desk which shall be perfectly steady and prevent one pupil from interfering with another.

The single pedestal is also made necessary in order that the support shall not be in the way, as would be the case if the desk and the chair were each provided with a separate pedestal.

An examination of the desk will show that the construction has been perfected all around and parts are strengthened where strength is required.

The wood parts are of hard Northern Maple which is the best wood to use in the desk top because it remains smooth through a number of years of service. There may be other woods that are considered by some to be more popular and attractive in appearance, such as oak or cherry, but a school desk top should never be constructed of oak for it will not remain smooth after years of service. It becomes necessary to refinish the oak, which is expensive and unsatisfactory.



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### *Second: Adaptation*

The manufacture of a desk which is adapted to be used by pupils is too well understood to require much discussion. It might be said in general that any desk manufactured is well adapted for the use for which it is intended, but it is to be noted here that some of the special adaptations are at the expense of more important demands made upon a desk. For example, if a desk is constructed with a lifting lid with the object of keeping out the dust and making it more convenient for the pupil to get at his books, it prevents its being made with a sliding top at a reasonable cost, which is a matter of proper hygiene, as will be explained later.

It is important, therefore, not to take a point of mere convenience in the place of one of hygiene.

Again, seats have been constructed of such length as to permit two pupils to occupy the seat at one time. This cancels the advantage of a seat, intended for one pupil, with properly curved back support as recommended by the State Boards and others who have investigated and reported upon this matter. It cancels the freedom in the movement of the arms and elbows. Anyone knows that it is more uncomfortable to sit on a bench than in a chair. It is therefore more important to have the pupils seated comfortably for five or six hours every day than to provide for the comfortable seating of an additional pupil for twenty or thirty minutes upon a few occasions only during the week.

To re-state this in another form—it would be better should classes have to be brought together, that they should be uncomfortably seated, or provided with temporary additional seating, for twenty minutes than to have all of the pupils uncomfortably seated for the whole of the time.

In both of the above mentioned illustrations a mere matter of convenience has been allowed to push aside a much more important question of hygiene.

In the construction of the Single Pedestal Desk the most important demands are secured first so that no unimportant matter of mere convenience is to be mentioned as an objection, to the adaptation of the Single Pedestal Desk with sliding top to the pupil's use, when the most necessary points have been given proper consideration.

### *Third: Sanitation*

Under this head it is important to note at the outset that the methods formerly employed in sweeping school rooms are no longer to be tolerated. It was customary some time ago to raise such a cloud of dust that the janitor had to wear a sponge over his mouth to "stay on the job." After this dust settled it was fluttered off again into the air by "dusting" and continually stirred around by the pupils, creating the most insanitary conditions, and there is no longer any doubt in the mind of anyone that regulations by Boards of Health throughout the country to prevent these conditions are fully warranted, not only on account of germs of disease but on account of permanent injury to the lungs by breathing dust.

These facts, in connection with sanitary requirements, have only recently been brought out and are as yet insufficiently understood by many who are responsible for the seating of schools.

It has been made necessary to secure a Sanitary Desk.

This demand is a more important one than the matter of construction or adaptation, or, in other words, this demand dictates the construction and adaptation, but it must not be secured at the expense of the demands of hygiene. This demand of sanitation has been *perfectly* secured in the Single Pedestal Desk.

By looking at the accompanying illustration of desks as installed in the school room, the open floor is obvious. Prepared sawdust can be thrown all over this floor and swept up with an ordinary brush. Vacuum cleaning apparatus can be used on the floor without being in any way interferred with by the desks.

As a matter of practical demonstration, the floors of rooms seated with this desk can be as readily cleaned as though there were no desks placed upon the floors at all.

Another point to be carefully observed is the fact that the pedestal comes right down to the floor, and makes so close a joint with the floor, that no dust or dirt is left and no dust or dirt can accumulate in open cracks or crevices on account of open joints.

Still another point to be carefully noted is the free open space upon the floor where the feet of those who are going up and down the aisle require the most room, there being no side standards to stumble over. Where desks have many floor contacts, the sweeping of the floor is not only made difficult, but experience shows that it is practically impossible to get a cleanly swept floor on account of the fact that there will be places that are not reached by the cleaner or brush. The floor may look presentable from the standpoint of the casual observer, but it would not be satisfactory from the standpoint of an officer of the Board of Health.

The Single Pedestal Desk not only provides for this sanitary cleaning, permitting the use of vacuum cleaners, but it also economizes time. The janitors say that they can clean a floor better in about one-third of the time that it takes to clean floors where the desks with side standards are in use.



### *Fourth: Hygiene*

The most important demands made upon a school desk come under this head. First, the chair must be properly shaped; the back support of the chair must provide proper support and must be curved for comfort. Proper support of the back of the user is of paramount importance. As a matter of fact, no kind of a back will be used unless the desk has a sliding top, for whenever a pupil starts to read or to write he leans forward to reach the ordinary top, and he might as well be seated upon a stool. In the chair of the Single Pedestal Desk the pupil sits erect with the back properly supported, and when he starts to write he pulls the sliding top out and remains erect and properly placed in his chair.

All of the above avoids the tendency to improper sitting position, leading to injurious pressure on nerve centers and deranged blood circulation.

It has been definitely decided by the highest authorities who have given exhaustive study to this subject, that the chair or seat described embodies the feature necessary to proper hygiene. The literature upon this subject is large and easily obtainable and no further discussion need be given the matter here.

There are two adjustments needed in a school seat—the vertical adjustment and the horizontal adjustment.

The horizontal adjustment is perfectly obtainable in no other way except by the use of the sliding top. So-called arbitrary plus and minus adjustments have been provided in other desks by a rather complicated adjustable construction requiring the use of side standards and four or more floor contacts. Such adjustment not only cancels the sanitary advantages heretofore mentioned, but it does not accomplish what it is intended for. It is secured in connection with vertical adjustment. Whenever such a desk is to be lowered it also comes closer together as a result of the plus and minus adjustment.

It is to be noted here that this plan assumes that every short child is also a thin one, and it will be readily seen that such a horizontal adjustment is impractical.

The many and hygienic advantages of the sliding top should be carefully studied in detail:

There has been an insistent demand for a sliding or removable desk top on pupils desks, but for various reasons, until the introduction of the design illustrated herewith, a practicable device of this character was not available.

The sliding top feature offers in desks so equipped, the most perfect article of school equipment yet devised by scientific students of school hygiene. In no other manner is it possible for the pupils to draw their work toward them and remain in the normal, natural and proper position, conducive to health and necessary to discipline and proper work.

The common practice of the pupil leaning against the edge of the desk is prevented by the sliding top, which moves forward with a slight pressure, and insures against the pupil assuming a most injurious position, that contracts the lungs and exerts pressure on delicate nerve centers.

The proper use of the sliding top is naturally induced, and does not require discipline or instruction, observation having demonstrated that the natural inclina-

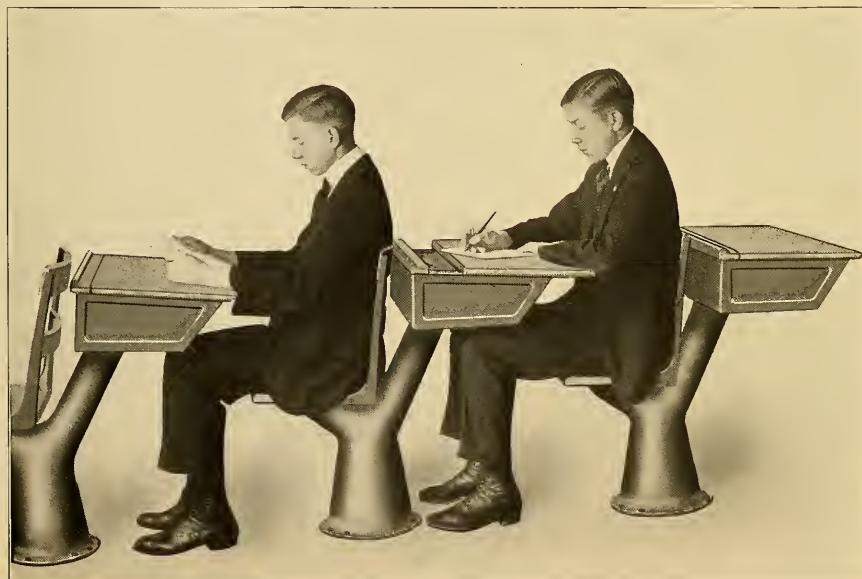
tion on the part of the user to automatically bring the work to its proper and convenient position insures the proper, and consequently comfortable, position of the user himself.

The top thus extended offers its full area for working surface, the pencil groove and inkwell being beyond and below, and offering no interference with large books, paper and other working materials, and when top is closed, pencils and other articles are covered and protected, preventing at all times their being pushed from the top of the desk and falling to the floor.

The sliding top in addition to the advantages of use, facilitates to a marked degree, ingress and egress.

The proper placing of the desks with sliding top necessitates additional floor space of only a few inches, and in but one direction. This is a negligible quantity, especially when the many advantages of the sliding top are considered.

A graphic demonstration of the advantages of the sliding top is offered in accompanying illustrations.



## *Adjustment*

The pupils seated in one room differ in size. Therefore, school desks must be adjusted to the pupils. Briefly, this vertical adjustment of the height of the seat and of the desk top must be such that the larger pupils will not have to lean forward to reach the desk top or not be interfered with on account of the desk being too small. The smaller pupils must have their feet upon the floor and must have a desk top to correspond to the height of the seat.

It will readily be seen that these demands are hygienic ones.

If the desk top is too high the shoulder is twisted to one side; if it is too low the pupil bends over away from the back of the seat at all times; if the seat is too high and the pupils' feet do not reach the floor it interferes with nerve centers and circulation, giving rise to trouble which must be prevented by proper vertical adjustment.

The vertical adjustment required by the difference in the size of the pupils can be gotten by the use of two different methods—first, make the seats adjustable and adjust them to the pupils after they have been seated. Second, ascertain the range of difference required and place the proper sized desks in each room.

The first method has for many years been exploited as the only method. Adjustable seats have been installed in hundreds of school buildings by school officers who recognized the importance of proper adjustment of the size of the desk to the pupil, but they necessarily had to depend upon their intelligent use. Lack of attention to this matter, the indifference and negligence of teachers and janitors has rendered this method practically inoperative. It is a common practice to find buildings which have never had the seats adjusted and where the necessary wrenches are not to be found on the place. If the matter received the proper attention it would call for considerable outlay of time on the part of the teacher, and also on the part of the janitor. It would have to receive this attention regularly, and in the long run would prove a very troublesome method, liable at any time to fail from mere lack of attention.

It is also to be distinctly borne in mind that, in case this method received the proper attention, the lack of properly understanding just how to make the adjustment defeats the very object of it.

The practical failure of the method has caused school officers who recognized the importance of having the pupils properly seated, to look for some other way to secure this form of adjustment, and has developed the second method.

The second method has, in a crude way, been in use for many years, that is, to a limited extent. In other words, seats have been made in different sizes and have been purchased in a hit-and-miss manner with the intention of providing in a general way for the difference in size of pupils. When the estimates for the different sizes of desks are carefully made, non-adjustable seats have proven to be fairly satisfactory.

It now remains to show how this difference in the size of pupils can be based upon scientific knowledge and a corresponding arrangement to the size of the desk be made in such a careful manner as to provide for a practically perfect adjustment.

*Fixed Adjustments*

In presenting this method of providing for proper adjustment, it should be thoroughly understood at the outset that it is in no sense arbitrary. Sizes and seat heights should not be arbitrarily averaged up by the companies manufacturing school desks.

Much scientific investigation is necessary, and when this scientific investigation is properly and fully made, it provides the manufacturer of school desks with the facts that must govern him. Many thousands of children have been measured in different cities in the United States and careful studies have been published, which are only to be found in the technical publication of scientific societies.

We present one of the most interesting tables of these measurements, which will serve in part to show the source and value of this scientific data.

ANTHROPOMETRIC SCHEDULE													
AGE	6	7	8	9	10	11	12	13	14	15	16	17	18
SEX	BOYS	GIrlS	BOYS										
36 in.	.1												
37 -	.1	.1											
38 -	.5	.2	.1										
39 -	.1	.8	.1	.1									
40 -	4.7	2.2	.7	1.6	.1	.1	.1						
41 -	7.9	5.5	1.7	6.1	.2	.3	.1	.2					
42 -	17.4	12.3	5.0	11.9	.1	1.0	.1	.2					
43 -	20.6	19.8	8.9	16.7	2.2	3.0	.1	.4					
44 -	20.1	22.4	17.7	20.3	4.8	6.0	.2	1.2					
45 -	13.5	16.3	19.0	17.0	10.1	5	3.5	2	.9				
46 -	7.6	11.5	19.0	14.7	15.2	17.6	1.9	7.7	.9	1.4	.6	.2	.1
47 -	3.7	9.3	14.2	5.6	20.5	17.9	5.0	9.8	3.0	4.8	.5	.7	.3
48 -	1.7	2.2	7.9	3.6	18.5	16.5	11.3	16.6	5.8	7.0	2.0	2.4	.6
49 -	.5	6	1.2	1.0	13.3	18.0	15.2	18.6	12.8	11.3	3.9	4.1	1.0
50 -	.1	.3	1.4	.3	8.3	7.8	20.1	17.8	15.4	16.2	9.2	8.1	2.5
51 -	.3	.4	.2	8.7	4.1	17.5	11.4	16.1	17.5	12.6	11.7	5.8	4.6
52 -		.1		1.9	1.4	12.9	6.9	16.6	16.3	14.8	16.9	8.8	6.5
53 -				.4	.6	7.8	2.6	11.9	10.5	15.8	13.2	14.0	11
54 -				.6	.1	4.2	1.7	8.4	6.5	14.5	13.6	15.0	11.8
55 -				.1	.1	2.0	.7	4.5	3.4	12.0	11.2	16.0	13.7
56 -					.1	.1	.5	.1	2.7	2.4	7.4	7.0	13.0
57 -						.3	.1	.9	9	3.1	5.5	8.5	10.9
58 -						.1	.3	.4	1.8	2.6	6.2	8.1	10.7
59 -						.1		.1	.9	1.5	3.9	6.9	9.1
60 -								.1	.4	.3	2.5	3.8	5.8
61 -									.1	.4	.3	2.5	3.8
62 -									.1	.1	.7	.9	3.2
63 -									.1	.1	.3	.6	1.6
64 -										.1	.2	1.0	.7
65 -										.1	.2	.9	.3
66 -											.1	.2	.9
67 -												.4	.1
68 -												.1	.1
69 -													.8
70 -													.5
71 -													3
72 -													.1
NUMBER OF CASES MEASURED													
1258	987	1919	1199	1481	1299	1497	1149	1363	1089	1206	936	1258	935
98.3	98.1	98.3	98.5	98.5	97.4	97.9	96.6	97.2	92.2	95.3	96.9	94.9	91.6
PERCENTAGE PROVIDED FOR BY SEATING RANGE OF TYPE (21 INCHES) (using three or four sizes of desk per room)													
98.3	98.1	98.3	98.5	98.5	97.4	97.9	96.6	97.2	92.2	95.3	96.9	94.9	91.6
91.8	86.4	95.6	85.2	95.4									

## *Explanation of Schedule*

In the above schedule we present only the ages ordinarily found in the common graded schools, and have omitted the number of pupils in each separate dimension of height, giving only the percentage.

The number of pupils measured in each class, however, is given in the total footings at the bottom, and the percentage given in each case is the percentage of the pupils measured in that class of age and sex. The percentages are given to the nearest tenths only, although in the original tables it is carried out to greater accuracy. For example, in 1,258 boys six years of age, one was 36 inches high, one was 37 inches high, five-tenths of one per cent was 38 inches high, 1.1 per cent was 39 inches high, etc. It will be seen that the average height for boys six years of age is about 43.5 inches and the range of difference above and below this average is about 7½ inches.

In a similar way, if you will find the average for any group of boys or girls at any given age, the range above and below this average will be from 7½ inches, as found in this group, to about 10 inches in the group where the greatest extremes occur.

About 22,000 pupils were measured in making up this schedule, and the number measured in each case is put below each column.

The next point to understand in studying this schedule is the fact that about one-fourth of the height gives the part of any pupil's height up to the knee. More accurately, it has been found that a practical multiplier to obtain the seat height (taking into consideration also the height of the shoe heel) is .23. In other words, to find the proper seat height for any pupil multiply the height by .23.

According to these facts, seats do not have to provide for a range of difference in heights from 7½ inches to 10 inches, but for only about one-fourth of this difference. It has, therefore, been concluded from a study of these results, and from further study of other material of a similar nature, that the range of adjustment to be provided in the height of seats is 2 inches for each group. If a room is seated with desks with seats in three different sizes, this range of 2 inches is provided.

Referring to the bottom row of figures given in the schedule, we have the exact percentage of the pupils in each class who are perfectly accommodated by providing a range of 2 inches. Theoretically, according to these figures, there should be on the average about 4 per cent of the pupils that are beyond this range. Where this average is exceeded compensation is made in installation as per tables hereinafter given. Practically by the actual use of this range of 2 inches to the room, over 50,000 pupils have been examined as to whether they were properly seated in this manner, and no ease has been reported in this large number of pupils as improperly seated or having the feet off the floor.

Just why it should be that no pupils have so far been found with their feet off of the floor when seated in rooms providing the range of 2 inches, has not been ascertained as yet. It has been suggested that, in the case of extremely short pupils in any given group, the loss in height is probably in the length of the trunk and not in the length of the limb; no doubt there have been cases where the pupils could have used a seat a little higher, but these cases have never been reported as uncomfor-

ably seated, because the knee lengths of these pupils was very slightly in excess of the average and they simply put their feet out a little further, the same as they would have done if they had been occupying any other chair somewhat lower than the average height of the chair provided.

In cases where pupils which are over or under age fall into any one of the groups given when seated in a room with them, it is found that the range of 2 inches is sufficient to accommodate them with the proper height of seat.

Attention to the facts explained in what follows will make this plain.

## Measurements and Sizes

The way in which these measurements are related to the grades on the one hand, and to the sizes of the desks on the other, can be seen by an examination of the following table. It should be remembered that variation caused by pupils that are ahead or behind their grade is also provided for by the relations given in the table. The height of the seat only is given because the height of the desk top is made in correct proportion to the height of the seat, and when one is secured the other is also secured when the seats are arranged in rows so that no seat of one size shall be placed in front or behind one of a different size.

In examining this table it should be read as follows:

Children in the first and second grades from six to eight years of age have knee length, or require a seat height ranging from  $11\frac{3}{4}$  inches to  $13\frac{3}{4}$  inches, which is provided by using desks of the sizes numbered 6, 5, and 4, as will be seen by referring to the seat height of these sizes given in the last column.

In the third and fourth grades, the pupils take height of seat ranging from  $12\frac{3}{4}$  inches to  $14\frac{3}{4}$  inches, and take desk sizes numbered 5, 4 and 3.

In the same way, fifth and sixth grades take sizes 4, 3 and 2, and seventh and eighth grades take sizes 3, 2 and 1.

This is a general outline of the arrangement showing the corresponding age, grade, knee length, seat size, and seat height, and is in accordance with the known facts of the variation in the sizes of the pupils as determined by scientific investigation.

### Schedule C.

*Compensation table showing the placing of desk sizes in exact accordance with the known variation in the sizes of pupils.*

Grade	Ages in each grade	Knee length or seat height	Compensating size of desk	Seat height of the size
1 <sup>st</sup>	6 to 7	$11\frac{3}{4}$ " to $13\frac{3}{4}$ "	6 - 5 - 4	No 6 - $11\frac{3}{4}$
2 <sup>nd</sup>	7 " 8	$11\frac{3}{4}$ " " $13\frac{3}{4}$ "	6 - 5 - 4	5 $12\frac{3}{4}$
3 <sup>rd</sup>	8 " 9	$12\frac{3}{4}$ " " $14\frac{3}{4}$ "	5 - 4 - 3	4 $13\frac{3}{4}$
4 <sup>th</sup>	9 " 10	$12\frac{3}{4}$ " " $14\frac{3}{4}$ "	5 - 4 - 3	3 $14\frac{3}{4}$
5 <sup>th</sup>	10 " 11	$13\frac{3}{4}$ " " $15\frac{3}{4}$ "	4 - 3 - 2	2 $15\frac{3}{4}$
6 <sup>th</sup>	11 " 12	$13\frac{3}{4}$ " " $15\frac{3}{4}$ "	4 - 3 - 2	1 $16\frac{3}{4}$
7 <sup>th</sup>	12 " 13	$14\frac{3}{4}$ " " $16\frac{3}{4}$ "	3 - 2 - 1	
8 <sup>th</sup> .	13 " 14	$14\frac{3}{4}$ " " $16\frac{3}{4}$ "	3 - 2 - 1	

### *Distribution of Sizes*

By using three sizes of seats to the room the required difference of 2 inches in seat heights is provided, but it remains to provide for a proper distribution of these sizes. By far the larger number of pupils are the average size corresponding to the grade, so that when seats are placed in rows more rows are used of the average size. Additional rows of different sizes are placed according to what has been determined by the scientific examination and measurement of the pupils in each grade.

We present below a table showing how the number of rows are made to correspond to the special requirements of each grade or room, allowing six rows to the room of standard size, 30 feet by 25 feet. The first part of the table will show the proper distribution for each grade. The second, or right-hand table, gives the distribution when one grade occupies two rooms. They are marked in the table as the "A" and "B" divisions of each grade. When more than two rooms are occupied by one grade, duplicate the "A" or "B" plan for that extra room or rooms.

If two grades are to be placed in one room, use either the "B" plan of the higher of these two grades or the "A" plan of the lower of these two grades so combined.

The distribution of sizes by rows given in the tables are based upon average figures and conditions. If any conditions in the seating of pupils in any school are known to differ to any great extent from the average conditions found in our cities, some variation of the distribution given can properly be employed. For example, the seventh or fifth grades, or third grade, rooms could be seated with two rows of each of the three sizes used in those grades respectively. As a matter of fact, the actual experience of schools using a distribution of sizes corresponding approximately to the above distribution shows that the adjustment so provided has been satisfactory in every case.

Schedule B.

## Distribution of sizes of seats

Table 1

Table 2

## Deck Signs

Desk Sizes.

Gr.	1	2	3	4	5	6	Cl.	1	2	3	4	5	6
8	3	2	1				A.	4	1	1			
							B.	3	2	1			
7	1	4	1				A.	2	3	1			
							B.	1	4	1			
6		3	2	1			A.		4	1	1		
							B.		3	2	1		
5		1	3	2			A.		2	3	1		
							B.		1	3	2		
4			2	3	1		A.			3	2	1	
							B.			2	3	1	
3			1	2	3		A.				1	3	2
							B.				1	2	3
2				1	3	2	A.				2	3	1
							B.				1	3	2
1					1	4	A.				1	2	3
							B.				1	1	4

## *The Placing of Rows*

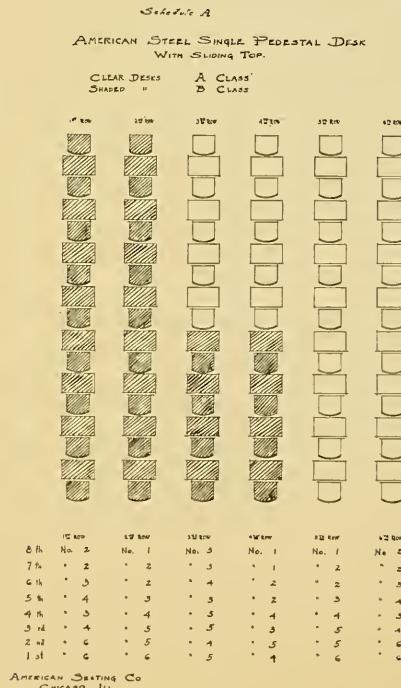
Since each room of pupils is generally, or very often, divided into two classes, the rows of different sizes should not be placed together. They should be arranged so that each class can be seated together, and have an equal number of seats of each size.

In the diagram given below the seats to the left of the teacher and nearest the door are those to be assigned to the "A" class, the other seats which are shaded in the diagram, and next to the window, are for the "B" class.

The distribution of sizes by rows given in the last table just above are placed beneath the table which follows so as to show just what size in each room is used for each grade. The numbers given under the rows for the several grades are the numbers of the size of the seat used in that row. For example—

8th Grade—No. 2, No. 1, No. 3, No. 1, No. 1, No. 2.

This is intended to show that the "A" class has a row of No. 2, a row of No. 1, a half row of No. 1 and a half row of No. 3. It will be seen that the "B" class has the same.



It is seen by examination of the foregoing plan that when one row or three rows of a size are used, they are placed in the center to prevent division of the classes where the room is divided into classes. In case two rows of three sizes should be used, each side of the room should have a row of each one of the sizes used.

### *Spacing of Seats*

The spacing of seats according to sizes in the Single Pedestal Desk with sliding top is different from the ordinary desk, more free space being provided. The distance from the back of one seat to the back of the next is determined by the size of the desk

Nos. 1 and 2—31 inches to  $31\frac{1}{2}$  inches

Nos. 3 and 4—28 inches to 29 inches

Nos. 5 and 6—26 inches to  $26\frac{1}{2}$  inches

The desks of the different sizes in each room may be spaced independently according to the size used in the row. If there are rows of desks of different size, each row may be given the back to back space used for this size, in which case the rows would not come out even in the front. The rows, in case this plan of spacing is used, will not line crosswise of the room. This is a matter of no consequence if it is determined that the proper spacing to correspond to the size should be adhered to, and many rooms have been seated in this way.

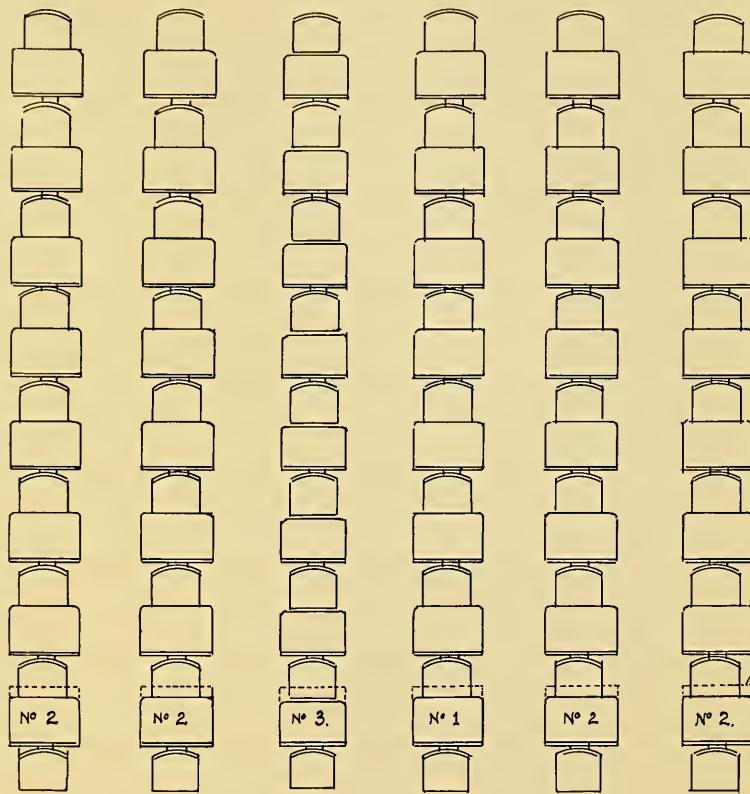
There is another method of spacing the desks where rows of different sizes are placed in the same room, and the back dimensions for the sizes used are not the same. They may be so spaced as to line both lengthwise and crosswise of the room by adopting the following average distances from back to back, and spacing every seat in every row in the room by this average distance:

Nos. 1 and 2 used with No. 3 } 30 inches.  
or, Nos. 2 and 3 used with No. 4 } 30 inches.

Nos. 3 and 4 used with No. 5 } 27 $\frac{1}{2}$  inches.  
or, Nos. 4 and 5 used with No. 6 } 27 $\frac{1}{2}$  inches.

We present here a draft of a seating plan for class room seated, for the seventh grade, according to this method. This is drawn to an exact scale and shows how the room appears when seated with sizes 1, 2 and 3, the average distance of 30 inches being taken for back to back spacing. The small difference in spacing is taken care of by the sliding top and is not noticed by the pupil. Many rooms have been seated in this way with the best of results.

THE SOLUTION OF THE SCHOOL ROOM SEATING PROBLEM



AMERICAN STEEL SINGLE PEDESTAL DESK WITH SLIDING TOP



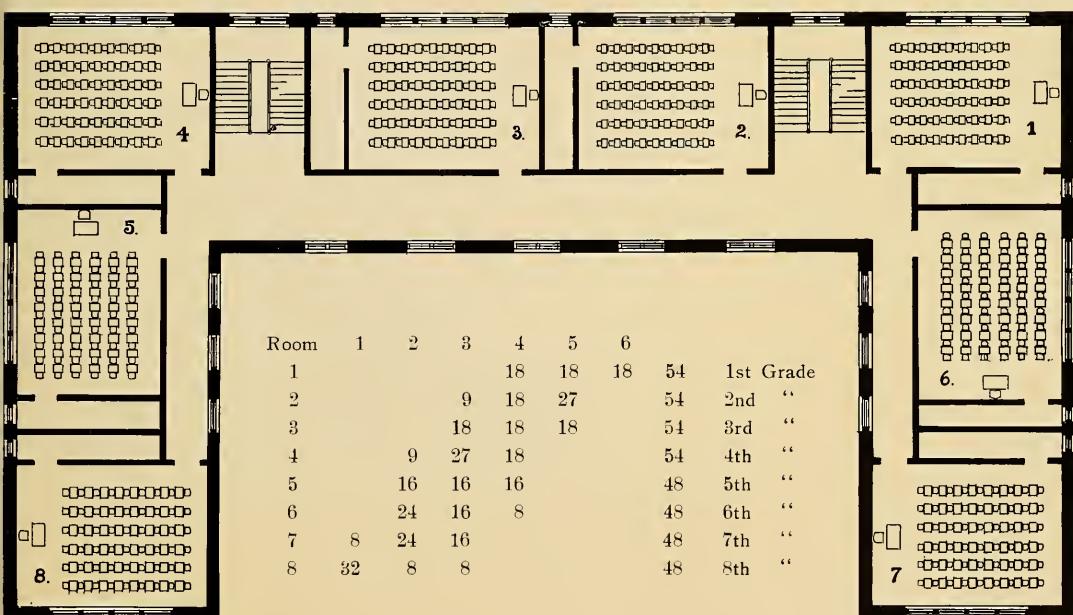
PLAN D.

## Floor Plans

When the rooms in any building have been assigned to the grades that will occupy them and the plan of permanent adjustment has been worked out, blue prints of floor plans are furnished by the American Seating Company gratis.

It is necessary that these matters receive the attention which their importance demands, so that no confusion shall result and no mistakes be made.

A sample of blue print furnished in one of the cities using the Single Pedestal Desk is here shown.



## Installation

The American Seating Company, when offering the Single Pedestal Desk with sliding top, prefers to include the cost of installation in the cost of the desk and to have them installed by their own special men.

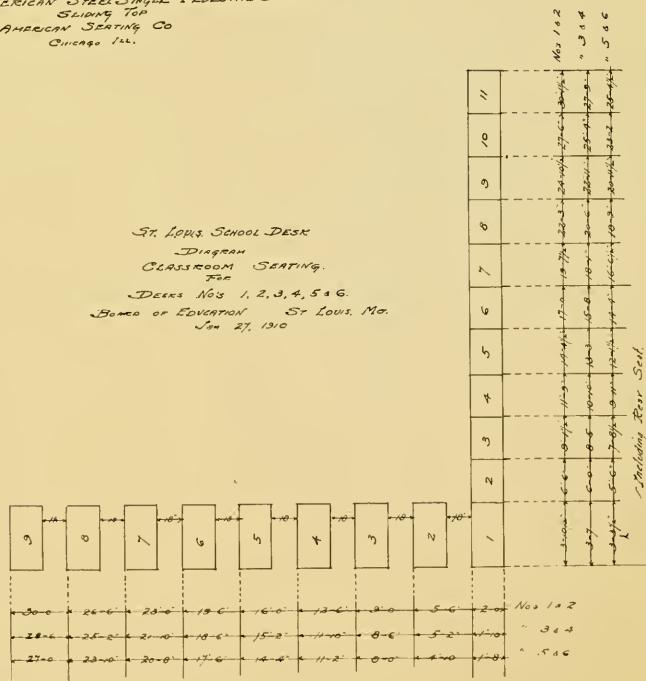
It is, therefore, important to place in the hands of School Boards using this desk a blue print which gives the proper dimensions for spacing and aisle widths so that inspection can be made of the installation.

We here show the schedule of dimensions for the installing of desks of the various sizes in accordance with the first method mentioned above. This is the method where each size has its special back to back spacing.

In case the back to back spacing is averaged, as suggested in the second method of "Spacing of Seats," a schedule of dimensions for installing them in accordance with this method will be furnished to be used for the inspection of installation.

*AMERICAN STEEL SINGLE PEDESTAL DESK  
SLIDING TOP  
AMERICAN SEATING CO.  
Chicago Ill.*

*ST. LOUIS SCHOOL DESK  
DIAGRAM  
CLASSROOM SEATING,  
TOP  
DESKS NOS. 1, 2, 3, 4, 5 & 6.  
BOARD OF EDUCATION, ST. LOUIS, MO.  
Jan 27, 1910*



## *How to Estimate Seating*

When anyone wishes to make an estimate of the number of seats it will take to properly seat a school, or schools, it should be done in the following manner:

Ascertain number of rooms to be seated;

Put opposite each room the grade, or grades, that are to occupy them;

Then refer to the tables heretofore set forth and make a list of the number of rows of each size to be used in each room, according to the instructions heretofore given;

Determine how many seats are to be placed in a row and state what this number is after each room estimate.

It is customary to put from seven to eight desks of the larger sizes in a row and from eight to nine of the smaller sizes in a row, there being six rows to a room of standard size. This provides for aisles about three feet wide, or more, in the rear and eighteen-inch aisles between the rows. There is a space left in the front of the room of eight to ten feet.

A floor plan for each floor seated should be made, giving the numbers of the rooms to correspond with this estimate. If this information is given to the American Seating Company they will furnish seating plans for the buildings, or for the floors, or for the rooms to be seated.

A very satisfactory estimate for the number of seats to be used in a building which is to be occupied for the eight elementary grades can be made without the above information in case such information is not to be obtained, and is determined in the following manner:

From figures at hand it is found that the number of pupils enrolled in each of the eight grades bear a ratio to each other which is on the average as follows:

8th Grade 1.
7th Grade 1.
6th Grade 1.25
5th Grade 1.4
4th Grade 1.6
3rd Grade 1.8
2nd Grade 2.
1st Grade 2.25

It follows from this that the number of seatings required for each grade is in ratio as above stated, that is, about as many will be seated in the seventh grade as are seated in the eighth grade, but there will be one and one-fourth times as many of the sixth grade seats used as are used in the eighth grade; there will be 1.4 times as many of the seats which are used in the fifth grade as are required for the eighth

grade; 1.6 times as many of the sizes which are used in the fourth grade, etc. From this we obtain the following table:

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
8th	3.	2.	1.			
7th	1.	4.	1.			
6th		3.75	2.5	1.25		
5th		1.4	4.2	1.4		
4th			3.2	4.8	1.6	
3rd			1.8	3.6	5.4	
2nd				2.25	6.	4.
1st				2.25	2.25	9.
TOTAL	4.	11.15	13.7	15.55	15.25	13.

The sum of these totals for all sizes is 72.65.

By using the totals for each size in comparison with this sum of totals we obtain the approximate percentage required for each size. For example, the total of four rows of No. 1 size is about 6 per cent of all of the rows. The No. 2 size is about 15 per cent, etc. As a result of this calculation we find that in any given order of desks to be used by all of the eight elementary grades, we would have the following table:

No. 1—	6 per cent of the total number required.
No. 2—15	" " " " "
No. 3—19	" " " " "
No. 4—21	" " " " "
No. 5—21	" " " " "
No. 6—18	" " " " "

100 per cent.

When the number of rooms to be seated is known, the number of rows for each of these rooms can be worked out. It will readily be seen, however, that this method of estimating is more difficult and more unsatisfactory than the other method given.

This would only work to advantage in large schools, where the number of rows can be adjusted approximately to the results obtained.















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